

dataschalt scientific paper



High-speed sorting using dataschalt

High-speed sorting using dataschalt and Matrox technology

Many companies are experiencing increasing competition in their industries as a result of globalization. This increased competition and the associated cost pressures lead to higher demand for the automation of repetitive sequences and processes in production. This applies both to the food industry, with consumers as end customers, as well as for mineral extraction in the framework of industrial manufacturing processes. Therefore, among the developments at the dataschalt group of companies in Luebeck, are machines which help our customers increase their degree of automation. Our customers are gaining a competitive advantage due to the higher quality of their products and lower costs. dataschalt has become specialized in the production of sorting machines for bulk solids. Through continuous development of existing machines by the dataschalt engineers and technical innovations, dataschalt is now in a position to offer a new generation of machines which meet all customer needs for the automated sorting of bulk solids. This development process and its result are explained in more detail below.

The development of sorting systems technology

dataschalt has been producing sorting machines for the optical sorting of solids for nearly 20 years. In 1995, the "Datasort" product line was introduced. The sorting electronics of this first generation of machines was based on a programmable circuit technology (Programmable Logic Device, PLD). With a standard industrial PC, in which a newly developed PC-card slot had been installed for control, the sorting machine could be comfortably configured and managed with a graphical user interface.

The Datasort machines were especially designed to optimize sorting functions in the food sector. Many machines were installed for well-known food brands. For their sorting needs, a classification for form and surface ratio was neither necessary nor, at the time of development, economical because the shape recognition algorithms were not realizable directly in the hardware. The former processors and digital signal processors (Digital



Author:

Kai Schwarz (Dipl.-Ing.)
Software Development

„Together with our partner Matrox, we have developed highly capable sorting intelligence which we can offer our customers in our sorting machines as well as in configurable sorting electronics.“

Signal Processor, DSP) lacked the necessary performance to process the huge amounts of data. A new generation of sorting machines was achievable only after a significant increase in the data processing speed.

A new generation of sorting machines

As a result of the rapid development in electronics over the last 14 years, particularly in the area of image processing, shape recognition and classification of bulk solids became possible within a very short period of time. These technical innovations have enabled dataschalt to significantly expand their machines' area of application. Thus, in 2004, a successful cooperation with the company Rhewum began to develop sorting machines for salt crystals. In order to separate crystals with embedded stones from the product flow using compressed air, identification of the precise form is essential, as the number of valves to be opened depends on the form. As a platform for sorting intelligence, this new development should not be an exclusive development by dataschalt, instead a provider with extensive experience in the area of rapid electronic image processing was sought.

Matrox: An experienced leader in image processing

The choice fell upon Matrox and the graphics card "Odyssey Xpro Plus". The card is characterized by extremely powerful data processing and a removable grab module. For fast image processing the card has the following:

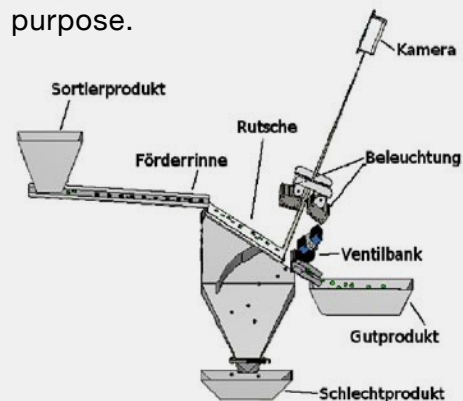
- an ASIC (Application Specific Integrated Circuit) for image processing (OASIC)
- a G4 Power PC processor
- and a customizable FPGA (field programmable gate array) for specific customer requirements is available

Development is done on virtually all platforms with the Matrox Image Library (MIL), providing powerful graphic operations independent of hardware.

In collaboration with engineers from Matrox, it was possible to integrate the Odyssey card into the sorting system so that the new electronics easily sort in free fall under the hard real-time demands. Since the synchronization of valve control and the camera is a time-critical process, it was necessary to implement the actual sorting logic as an independent program on the Power PC of the Odyssey card. Typically, the application is run on a Windows PC and only uses the computing power of the Odyssey card for MIL applications. Direct programming of the Power PC processor, as is utilized by the dataschalt sorting machine, is costlier and more complicated, but allows a significant performance increase and makes time-critical synchronization realizable. The

Basic mechanical procedure of the sort in free fall:

The feed and separation of the pieces using a vibration-screen conveying trough. The isolated pieces are accelerated using slide so that they can then be lit up and optically recorded. The optical recording is conducted by a CCD line camera. After the optical recording and processing, the rejected parts are removed by a pulse of compressed air. A valve array is there for this purpose.



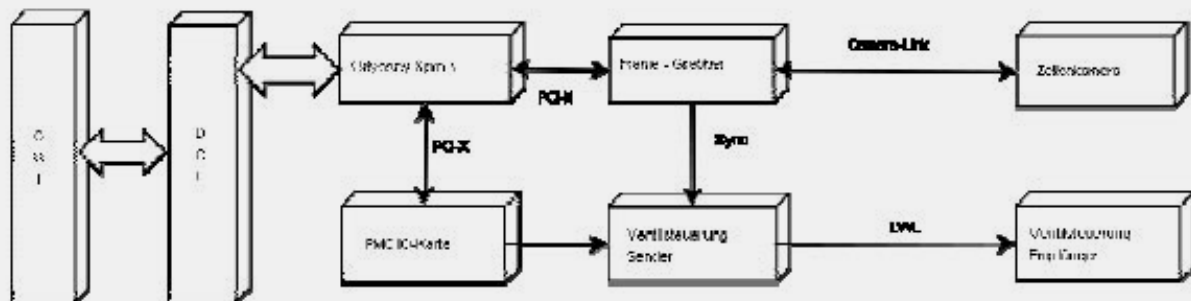
Mechanical construction of a sorter

sorting electronics developed as such are at the heart of the new Data sort SISCO (Size Shape COlor) sorting machine line and is a result of dataschalt's experience in sorting technology and Matrox's in experience image processing.

Datasort SISCO: A powerful, modular concept

The sorting electronics and software of the SISCO machines have been created with a modular structure in order to meet customer requirements, as well as to find applications in other products. Sorting Data Application (DSA) acts as an interface to the sorting electronics. Through the DSA abstraction layer the sorting electronics can be exchanged without the need to adjust the user. For example, there are FPGA-based sorting electronics for very specific sorting tasks, which can be worked with using the same surface as the machines in the Datasort SISCO line.

System Overview



The valve control used in the SISCO-sorting machines can process data from two sources. Thus, in addition to the valve of the optical data processing, further sensor data can be utilized, such as information from a magnetic sensor used to detect metallic impurities. The use of a camera link interface also allows for the use of other compatible sensors, such as an X-ray sensor. The diversity of the processable data allows the use of advanced electronics in many other of our customers' projects. Whenever high-performance electronics are needed to sort varied products, the technology developed by dataschalt is applicable. In this way, dataschalt can provide its customers with a turnkey sorting machine solution, along with powerful, configurable sorting electronics.

If you are interested in our sorting machines or want to use our sorting technology, please contact us

dataschalt 

Mark Ehrich | Managing Director
An der Huelshorst 7 - 9 | D-23568 Lübeck | Germany
phone: +49 451 29059-21 | fax : +49 451 38812-69
eMail: mark.ehrich@dataschalt.com